Citrus Peelminer Density Reduction with Bt-Cotton

K. Godfrey, D. A. Mayhew, S. Wright[1], and P. Goodell[2]

The citrus peelminer (*Marmara gulosa* Guillen and Davis; Lepidoptera: Gracillariidae) has been causing great concern in Fresno, Kern, and Tulare Counties since 2000. In the current infestation, citrus peelminer (CPM) has greatly expanded its previously known host range to include 67 plant species in 31 families. Although it has extensively mined cotton stems and bolls since 2001, no economic damage to the cotton crop has occurred. During cotton variety trials in 2001, it was noted that CPM could not effectively mine or survive in cotton plants transformed to include the gene for one of the *Bacillus thuringiensis* endotoxins. (Hereafter, those plants will be referred to as Bt cotton). The Bt cotton did not deter oviposition by CPM, so a study was conducted to determine if Bt cotton could be used to reduce densities of CPM within an area.

Assessment of Bt cotton in reducing densities of CPM in an area was conducted in a cotton field located near Plainview, Tulare County. Habitats adjacent to this field included black-eyed beans (south), kiwis and citrus (east), pasture (north) and alfalfa (west). At the south end of the cotton field, six row plots were established alternating between Bt cotton and non-Bt cotton. (Seed provided by Delta and Pine Land Company). The first plot was located immediately adjacent to the black-eyed beans. The plots were sampled approximately every two weeks beginning May 22. On each sample date, five black-eyed bean plants on the row adjacent to the cotton were examined for the presence of CPM. The number of active (mines containing live larvae) and inactive (mines with no larvae or dead larvae) mines on the stems and leaves, and the height of the stems were recorded. For each plot of cotton, five plants (one per row) were examined for the presence of CPM. The number of active and inactive mines on the stems and bolls were recorded. In addition, the height of the cotton stem and the diameter of the bolls were recorded. This sampling continued until September 24 for the black-eyed beans when the beans were harvested, and until October 15 for the cotton plots (plots were harvested).

The density of CPM in the black-eyed beans peaked in mid-July (Figure 1). All of the mining occurred in the stems, except for one leaf mine in late May. The pods were not mined. This crop appears to be a bridge for CPM from late spring weeds to mid-season cotton.

For the two types of cotton, a dramatic difference in density of CPM can be seen (Figure 1). The Bt cotton, in general, had very low densities of CPM with the majority of plants not being mined at all. The non-Bt cotton demonstrated a gradual increase in CPM density through early September (Figure 1). Much of the mining was located on the main stem. However, mining of lateral branches was found beginning at the end of July. Boll mining was found in both types of cotton, although substantially more mining was found in non-Bt cotton (Table 1). Boll mining began in mid-August when bolls were 2.5 to 5 centimeters in diameter. No mining was observed on squares or blooms.

In summary, the black-eyed beans appear to act as a transition crop for CPM. In cotton, CPM is able to build to very large densities over the summer and moves out of the cotton beginning in mid to late September. The Bt cotton supported drastically less CPM than non-Bt cotton.

Figure 1. The mean number of active CPM mines per cm of stem in the Bt cotton study in Tulare County in 2002. The bars represent the standard error of the means.

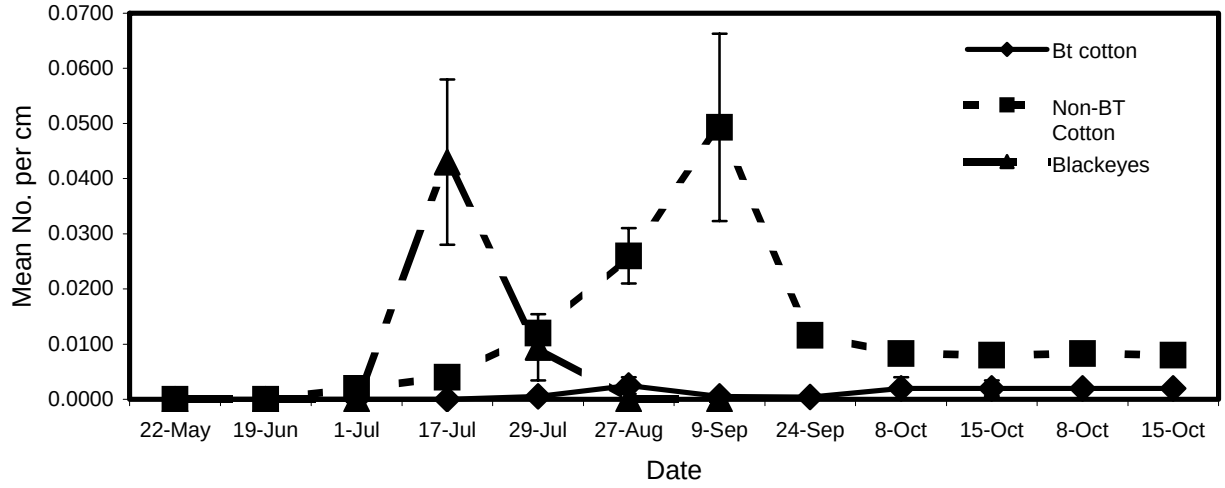

Table 1. The proportion and percent of bolls with active mines in the Bt cotton study in Tulare County in 2002. An attempt was made to sample 60 bolls on each date. At the end of the season, many bolls were open, so the total number of sampled bolls was less than 60.

	Non-Bt cotton		Bt cotton	
Date	**Proportion**	**Percent**	**Proportion**	**Percent**
August 13[a]	5/60	8.3	0/60	0
August 27	20/60	33.3	2/60	3.3
September 9	28/60	46.7	0/60	0
September 24	12/45	26.7	0/57	0
October 8	6/49	12.2	1/47	2.1
October 15	4/27	14.8	1/33	3.0

[a]From May 22 through July 29, no mined bolls were found.

[1]UCCE Tulare County, Tulare, CA
[2]UCCE, Kearney Agricultural Center, Parlier, CA
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